Recovery and Resilience Plans

Example of component of reforms and investments –

Digital components and cloud capabilities

Disclaimer

This document was produced by the Commission services. The views expressed in this document do not commit the European Commission.

The document takes into account the Proposal for a Regulation on the Recovery and Resilience Facility (hereafter 'the Proposal') adopted by the Commission on 28 May 2020[1] and the conclusions of the European Council of 17-21 July 2020,[2] the Communication on the Annual Sustainable Growth Strategy 2021 (hereafter ASGS)[3] and the Commission's Guidance to Member States on the Recovery and Resilience Plans.[4]

The document is intended to help Member States prepare their recovery and resilience plans and ensure coherence with the European flagships proposed by the Commission in the ASGS Communication.[5]

The document builds on the template[6] that was issued together with the guidance to Member States on the recovery and resilience plans. Its structure is based on Part 2 of the template, where each component of the recovery and resilience plan needs to be described. Therefore, this document does not cover the information that Member States are expected to include in Part 1 (general objectives and coherence of the plan), 3 (complementarity and implementation of the plan) and 4 (overall impact) of their draft Recovery and Resilience Plans.

The document contains examples of reforms and investments that Member States could include under a specific component in their Recovery and Resilience Plans, including some examples of the type of information required to describe the expected impact, to fulfil the green and digital tagging of measures and to set out the type of targets/milestones that have to be defined for each reform and investment in order to allow for the tracking of progress.

Given the fictitious nature of these examples, the document should not be regarded as comprising an exhaustive list of the most important reforms and investments in the mentioned area. Member States may cover different and/or broader mix of reforms and investments in their recovery and resilience plans. Furthermore, the description should not be regarded as complete. More details and evidence would be expected in the actual Recovery and Resilience Plans in order to ensure a proper assessment of the measures to be implemented.

[1] COM(2020) 408.
[2] EUCO 10/20.
[3] COM(2020) 575.
[4] SWD(2020) 205.
[5] The Commission in the ASGS strongly encourages Member States to include in their recovery and resilience plans investment and reforms in the areas of: renewables, energy efficiency, sustainable transport, broadband connectivity, digital public services, microelectronics and cloud capacities, and skills.
[6] SWD(2020) 205 PART 2/2.

PART 2: DESCRIPTION OF REFORMS AND INVESTMENTS

A. COMPONENT 6: SCALE UP (Digital components and cloud capabilities)

[*Please note that this example of a component is fictitious. It has been prepared by the Commission's services to provide guidance to Member States on some reforms and investments related to the European flagship 'Scale-up' that could be included in the national recovery and resilience plans.*

To substantiate the intended reforms and investments, the document references specific data sources, data sets and information relating to the baseline scenario, outstanding gaps, envisaged milestones, targets, including green and digital, etc. The references provided should not be regarded as comprehensive, compulsory elements to be replicated in national recovery and resilience plans. Member States can include other/additional details and evidence to clearly describe and justify the importance and coherence of the recovery and resilience plan and its contribution to the green and digital transitions, with a view to satisfy the assessment criteria set out in Article 16 and Annex II of the Proposal.]

1. Description of the component

Digital components and cloud capabilities

Policy area/domain: Digital

Objectives: With the advent of the data economy, it is of high strategic importance for European businesses and administrations to maintain trust in the management of their data. To do so, Europe must be able to rely upon accessible, trustworthy and sustainable **cloud services and infrastructures**, based upon trusted **digital components and systems**, and **foster capacity building and their uptake** among businesses and public entities operating across the European Single Market. Increased autonomy and inclusive access to digital technologies will improve Europe's resilience and enable us to address effectively societal challenges including those related to healthcare and climate change. It will re-inforce our security and boost competitiveness for our manufacturing and service industries, which increasingly rely on secure data, computing and communications infrastructures in their daily business. Reforms and investments in these areas will translate into reinforced technological leadership, increased **economic competitiveness and job creation**. Moreover, the component will contribute to close the skills gap, by training and thus enabling the recruitment of microelectronics and cloud specialists. This requires a massive and well-coordinated scale-up in investment efforts, coupled with an environmentally friendly approach, so that the benefits of deployment substantially outweigh its environmental footprint.

The specific objectives of the component are the following:

1. Strengthen Europe's design and production capabilities[7] in **microelectronics**[8] **technologies** with special focus on processors, the basis for fast, efficient and secure data processing for Artificial Intelligence (AI), communications networks, critical digital infrastructures and supercomputing.[9]

2. Build the European next generation of **interoperable, secure, real time and sustainable cloud, edge**[10] **and data capacities** based on accessible and trusted services, modular platforms and interconnected infrastructures that **will stimulate the cloud uptake among businesses and public entities** by responding to their new needs in terms of data processing.

Examples of reforms and investments: *[In the examples below, certain reforms and investments are presented separately. However, they are not necessarily expected to be separated in the plans and can be presented together to underline the synergies between them.]*

A. Microelectronics with focus on processors

a) Examples of reforms

A.1 - Adapt procurement policies to accommodate standards and certification requirements for trusted electronics in order to promote the uptake of secure components in public sector services and critical infrastructures.

A.2 - Stimulate the adoption of policies promoting the use of trusted digital microelectronics components and their implementation, also through the support of Digital Innovation Hubs.

A.3 - Develop incentive frameworks for risk capital supporting the development of microelectronics components for the green and digital transition.[11]

A.4 - Develop and implement a national strategy on microelectronics, including guidance on funding, to achieve the stated objectives.

b) Examples of investments

A.5 - Support a large-scale innovative industrial project, possibly in the form of an Important Project of Common European Interest (IPCEI) aiming at the development of cutting-edge capabilities and first industrial deployment in critical parts of the value chain.[12]

---

[7] Production capabilities refers to the process of building up the know-how and setting up the infrastructure in advanced semiconductor processing and manufacturing technologies. It does not include any industrial manufacturing of goods for trade.

[8] **Microelectronics** refers to the design and production of miniaturised devices called *chips*, containing digital integrated circuits or analog circuits based on **semiconductor** material (most commonly silicon). Hence, microelectronics devices are built with semiconductor technologies, but both terms are commonly used for the related industry.

[9] Excluding State aid public support to manufacturing.

[10] **Edge computing** is a distributed computing paradigm that brings computation and data storage closer to the location where it is needed, to improve response times and save bandwidth.

[11] In full compliance with State aid rules; this applies to all public funding measures mentioned in this component.

A.6 - Establish a venture capital fund and programmes for innovative start-ups and Small and Medium Enterprises (SMEs) in the design of trusted electronic components.

A.7 - Develop support programmes for companies active in the development of energy-efficient embedded components for devices at the edge[13] of the network, notably edge AI chips, to be integrated in edge-cloud platforms.

A.8 - Support investments in state-of-the-art equipment and transfer of knowledge by Europe's world-leading Research and Technology Organisations ("RTOs").[14]

A.9 - Design support frameworks for investments in infrastructure for research and development of semiconductor technologies for the fabrication of innovative and energy-efficient microelectronic components.

A.10 - Support companies engaged in the development of new products based on open source hardware.

B. Cloud, edge and data

In line with the objectives stated above, reforms and investments in the area of scaling-up cloud, edge and data EU capacities address both the supply and demand side:

B.1 - Upgrade (where existing) and build the next generation of resilient European, interconnected, real time, energy efficient, highly secured and distributed cloud to edge data centres and related nodes, for both the private and public sectors.

B.2 - Stimulate the emergence and deployment of the next generation of federated and competitive European cloud to edge services and platforms, leveraging existing initiatives[15], which respond to new users' needs in times of post-recovery.

B.3 - Support public entities, businesses[16] - including SMEs - and the users and providers of Common Data Spaces to uptake high speed, trusted and sustainable cloud capabilities ("cloudification[17]") to boost their transition in time of post pandemic recovery.

---

[12] Notably processor technologies, digital design, advanced packaging and wafer-level fabrication at leading-edge nodes (see section 3.b.i below).

[13] The edge is the part of a network that is closest to where data is generated, for instance by IoT devices.

[14] Research and Technology Organisations (RTOs) are regional and national non-profit actors with public funding, whose core mission is to supply services in support scientific and technology innovation for public bodies and industry. When it comes to State aid support to such entities, it should be verified firstly if they fall within the scope of "Research and Knowledge Dissemination Organisation" (Research organisation, RO) or "Research Infrastructure" (RI), as defined and supported under the existing R&D&I State aid rules (both R&D&I Framework and GBER). The future modifications of R&D&I Framework being considered by the Commission may provide also for the State aid support for another type of facilities, "Technology Infrastructures" (TI), under the scope of which some of the aforementioned RTOs might fall.

[15] Such as those in Austria, Belgium, Estonia, France, Greece, Ireland, Italy, Lithuania, Poland, Portugal, Spain and GAIA-X. The European Open Science Cloud (EOSC) could also be leveraged where directly contributing to build the next generation of federated cloud business capabilities in the EU. Where appropriate the recommendations developed by the Digital Transport and Logistics Forum on federated platforms could also be utilized.

B.4 - Support the operationalisation of Common Data Spaces via secure data hosting, access and exchange; product and service data innovation orchestration; and the stimulation of computing and data ecosystems.

C. Cross-cutting measures

C.1 - Support training, skills development and retaining talent.

Estimated cost: EUR XX.X million, of which EUR XX.X million (X%) are covered by RFF. *[Please provide costing estimate]*

2. Main challenges and objectives

a. Main challenges

The EU's digital transition depends on its ability to develop the most advanced, energy-efficient and secure microelectronic components and on equipping Europe with resilient, accessible, secure, real time, sustainable, industrial cloud, edge and data capacities. Currently, the EU lags behind global competitors and lacks European players. This is due to several factors: lack of scale, fragmentation, and uneven adoption of digitalisation across Member States.

Europe's share in global semiconductor production and cloud capabilities does not reflect its economic weight:

- The EU share of global production in semiconductors (~10%), processors and computing systems (~6%) is far below its global economic weight (20% of global GDP).
- Europe highly depends on a limited number of foreign suppliers for manufacturing and for key digital components such as microprocessors and accelerators, which are critical for any industrial, technology and data strategy.
- The public cloud infrastructure market currently features three global companies which hold together a 75% share at global level, leading to risks of lock-in and oligopoly as the market matures, whereas the largest European cloud service provider accounts for less than 1% of total revenues generated in the European market.
- The gap in the development and deployment of advanced digital technologies risks to increase as global competitors make substantial investments in advanced technologies such as AI, semiconductor manufacturing and edge computing.

[16] Cross-industry cloud enabled pilot projects aiming at designing and deploying smart grids, electro-mobility and industry 4.0 (based on robotisation and automation) are examples of potential investments related to the proposed reform, where appropriate for the economic sectors of the EU economy.
[17] Usage of cloud capabilities: infrastructures, platforms and services.

A true digital single market is necessary to overcome the lack of scale, fragmentation and investment that the EU economy is facing:

- Several digital technology markets are characterised by strong economies of scale and scope. Addressing the fragmentation of the European market is crucial to create the economies of scale and scope needed to ensure European competitiveness, resilience and strategic autonomy.
- On the side of microelectronics, the EU suffers from relatively low and fragmented investments compared to global players (e.g. the US announced a USD 25 billion semiconductors plan over 5 years to reduce its dependencies, also in reaction to a Chinese government fund mobilizing EUR 125 billion over 10 years).
- Lack of scale, scope and investment also characterise European Cloud Providers. For instance, the Staff Working Document on Europe's recovery needs released in May 2020 highlights a cloud investment gap of EUR 80 billion over the 2021-2027 period.[18] This hinders the capacity to set up resilient and sustainable cloud, edge and data infrastructures and services at scale that can compete with the actors that currently dominate the global cloud market.

Skills shortages[19]

- In the context of the initial recovery from the COVID 19 pandemic, there is a deepening of the gap in digital skills in the EU relative to growing demand, in particular in microelectronics and cloud technologies. These have become even more essential skills that businesses and governments seek in their employees.
- Cloud skills have become indispensable to enable new and productive working patterns. They are particularly relevant for the set-up of new collaborative cloud platforms and the deployment, operation and maintenance of highly distributed computing capacities at the edge. They have also become essential for transforming IT operations, fostering digital innovation and data analytics in businesses and governments.
- The European electronics industry is facing an acute shortage of skills in all tiers of its value chain. The number of open positions for electronics engineers is growing at an alarming rate. Nearly 1.1 million job advertisements for electro-engineering workers were placed in the EU between mid-2018 and end 2019 (Cedefop). In addition, more and more applications require workers with growing knowledge in software and data analytics. A steady pipeline of qualified personnel is critical to sustain competitiveness and growth of EU companies, generating employment opportunities also in the enabled industries and safeguarding European interest and sovereignty.

[18] SWD(2020) 98 final of 27.5.2020.
[19] Reference is made to the flagship "Reskill and upskill", SWD(2020) 205.

b. Objectives

The component is in line with the country specific recommendations (CSRs) related to digital in general for the Member State for the years 2019 and 2020. Investment and investment-related reforms focusing on cloud services and infrastructures / digitalisation of businesses and public administrations / digital transition (CSRX in 20XX) are recommended. [*Please indicate how each reform and investment aims to address which specific CSRs in 2019 and 2020*]. All proposed reforms and investments either implicitly or explicitly aim to increase investments in digital components and cloud capabilities.

The component also supports the European Flagship 'Scale-up'[20] by increasing European industrial data cloud capacities and Europe's ability to develop the most powerful, cutting edge, and sustainable processors. It will contribute to a significant increase in the production of semi-conductors in Europe and the delivery of 10 times more energy-efficient processors by 2025. This will in turn enable trustworthy and sustainable cloud services and infrastructures, boost uptake of advanced cloud services and big data among EU companies, and promote secure and sustainable digital transition across strategic sectors. As such, the set of proposed measures will contribute not only to the recovery but also to Europe's long-term resilience.

The overall objective is to develop and deploy advanced technologies and data processing capacities to boost EU technological sovereignty, competitiveness and delivery of trustworthy, secure and sustainable components and real time services to citizens, public entities, social partners and businesses. As part of the efforts to achieve this larger goal, this module addresses two key elements and pursues two related objectives.

Microelectronics components and systems: Improving Europe's design and production capabilities[21] of microelectronic components in strategic parts of the value chain is key for the roll-out of secure data processing and AI applications across sectors. Specifically:

- Processor technology for edge computing, edge AI and supercomputing critical to all digital infrastructures, both private and public, and vertically integrated projects addressing applications like 5G/6G, autonomous vehicles, data centres, aerospace and defence;
- Advanced technologies for ultra-low power AI components, based on brain-inspired computing (neuromorphic), and for future quantum computing systems;
- Advanced microelectronics design, leading-edge fabrication and packaging to clearly enhance value added of semiconductor technology in the EU and reduce excessive dependency on non-EU regions.

Technology innovations in microelectronics, from computing to smartphones to AI, have consistently been a driving force of productivity and economic growth. Reaching the limits of

[20] COM(2020) 575 final.
[21] See footnotes 7 and 9 above.

Moore's law[22] will lead to manifold breakthroughs in semiconductor technologies and architectures; this disruption, combined with the pervasive growth of heterogeneous edge devices, will generate great opportunities also to smaller innovative hardware companies. Investments in equipment and facilities to produce the secure and sustainable components required for EU's green and digital transformation, can create new virtuous ecosystems generating high-quality employment and economic prosperity.

Cloud, edge and data capabilities: foster the emergence of resilient, competitive, secure, trustworthy, real-time, sustainable, distributed, end-to-end data processing capacities across the EU, which will foster the cloud uptake among businesses and public entities. This will ultimately support a competitive, resilient and sustainable recovery of all the sectors of our European economy, by responding to new, specific and sectoral users' needs. To achieve this overarching goal, the following specific three objectives will need to be pursued:

- Equip Europe and its Member States with the next generation of resilient, sustainable, trusted, real-time, distributed, interconnected and end-to-end cloud to edge capabilities[23] to optimally seize the EU data opportunity.
- Encourage a holistic, resilient, sustainable and secure cloud uptake throughout all sectors (i.e. traditional and advanced) of the EU economy.
- Foster the operationalisation of the Common Data Spaces[24] via building robust data and cloud ecosystems while supporting innovation and secure data access and exchange at national level.

3. Summary description of the reforms and investments of the component

The following outlines a mix of reforms and investments of the component. The separation of reforms and investment is for illustrative purposes only. To the degree possible, their interlinkages and synergies should be explicitly mentioned and explained as part of their description. *[These are examples. Member States are asked to be more specific and to provide a more detailed description of the specific context of each suggested reform and investment, in line with the template. This should also include a description on how the intended reforms and public investment projects reinforce the effects of one another and how a Member State seeks to ensure that they are of a complementary and coherent nature.]*

[22] Moore's law is the observation that the number of transistors in a dense integrated circuit doubles about every two years.

[23] End-to end cloud to edge capabilities include data processing infrastructures, platforms and services.

[24] In line with the European Strategy for Data: "The Commission will support the establishment of the following nine common European data spaces: industrial (manufacturing), Green Deal data Space, mobility data space, health data space, financial data space, energy data space, agriculture data space, data space for public administrations and a skills data space"; COM(2020) 66 final.

Microelectronics

a. Examples of reforms

[For illustrative purposes, the first sub-component is developed in more detail, setting out the challenges, objectives, implementation mode, target population and timeline. The remainder of the reform examples are left at a higher level.]

i) A.1 - Alignment of national procurement policies towards common standards and certification for trusted semiconductor building-blocks and common requirements for procurement of secure components

Challenges: Currently the digital infrastructures of EU businesses, of public administrations and of critical infrastructures rely overwhelmingly on semiconductor components of different foreign conception and/or origin. The security of such systems starts from the security of their semiconductor building blocks. It is necessary to adopt policies making use of components compliant with safety standards and certification protocols to ensure the employed components are not compromised with malicious hardware and backdoors.

Objective: i) To remove industry fragmentation and facilitate quality and interoperability along the electronics supply chain up to the end-user application, thereby ensuring that EU citizens enjoy high levels of quality, safety and privacy from products and services relying on electronics; ii) to encourage the uptake of new technologies and development of new markets that benefit EU society and its economy.

Implementation: Identify necessary adaptations of procurement policies, possibly in cooperation with the European Commission, to accommodate common standards and certification requirements for trusted electronics, and in order to promote the uptake of secure chips in applications that rely on or make extensive use of chip technology including: secure networks, data processing, autonomous driving, robotic vehicles, electronic identification and trusted services within the remit of the eIDAS Regulation. Consider adopting policies for innovation procurement to stimulate the take up of state-of-the-art components in advanced computing, AI, IoT, 5G, cybersecurity.

Target population: MS, Industrial stakeholders, SMEs.

State Aid compliance: To the extent that the reform amounts to changes in legislation and identification of common requirements, no State aid concerns should arise where there is no transfer of State resources for the benefit of certain undertakings.

Timeline: start in 2021.

ii) Other examples of reforms

- **A.2 - Stimulate the adoption of policies promoting the use of trusted digital microelectronics components** and their implementation, boosting EU's microelectronics industry and providing public and private users with secure digital solutions. Promote the use of advanced chips (e.g. in edge AI) by SMEs in vertical sectors such as manufacturing, agriculture, transportation and healthcare, possibly through the support of Digital Innovation Hubs, and stimulate the adoption of

innovative embedded AI solutions through info-days, workshops, trainings involving SMEs and end-users from specific vertical sectors.

- **A.3 -** Develop State aid compliant **incentive frameworks**[25] **for risk capital** and public de-risking schemes to support investments in the development of microelectronics **components for the green and digital transition**. Engage in dialogues with national promotional banks, financial institutions and venture capital investors, to determine the optimal conditions attracting private capital investments.
- **A.4** – **Develop and implement a national strategy on microelectronics**, including guidance for the EU and national funding of R&D and industrial deployment activities, and redact a national census of companies active in microelectronics, to be updated at least every 5 years.

b. Examples of investments

i) A.5 - Support large-scale innovative industrial project development in the form of an Important Project of Common European Interest (IPCEI)

Challenges: To reinforce the EU microelectronics ecosystem by gaining leadership in strategic innovative technologies, thereby reducing extreme dependency on chips produced in other parts of the world.

Objective: Development and first industrial deployment of cutting-edge capabilities in Europe in i) processor technology addressing performance needs such as speed, power consumption, security and reliability that span edge-computing and edge-AI to supercomputers, and strategic applications such as secure connectivity and automated vehicles ii) advanced technology design, advanced packaging and wafer-level fabrication at leading-edge nodes, to increase value-added of the EU microelectronics ecosystem.

Implementation: Launch open calls for expression of interest at national level among industrial stakeholders, including SMEs and end-user industries, to select a first pool of projects meeting objectives and requirements for potential participation in a new IPCEI on microelectronics. The projects must address critical gaps in the ecosystem, be ambitious, delivering innovation in products or processes beyond the state-of-the-art and followed by first industrial deployment (e.g. pilot lines) with positive spill over effects beyond the undertakings, sector and Member States concerned. Once projects have gone through this first selection at national level, the work will have to start to set up an integrated project across Member States and to determine which projects fit in. Projects will have to show, i.a. significant added-value to the IPCEI, significant spill over effects and be fully integrated.

Target population: Industrial stakeholders up to end-users industry, SMEs.

State Aid compliance: The envisaged investment may include State aid depending on the specific structure and purposes of the project. The IPCEI Communication gives guidance on the assessment under State aid rules of public financing of such large cross border projects up

[25] Including provisions for fiscal incentives, in full compliance with State aid rules.

to the first industrial deployment phase. Therefore, Member States can use RRF funding to support individual company projects for which aid is authorised by the Commission as part of an IPCEI.

Timeline: The implementation period should start as soon as possible, with the aim of an IPCEI completed by the end of 2025.

ii) A.6 - Establish a venture capital fund and incentive programmes for SMEs and start-ups in the design of digital components and creation of IP

Challenges: Fabless companies[26] focusing on digital Integrated Circuit designs are the fastest growing segment in microelectronics (15% CAGR) and often the most innovative ones, but Europe only has less than 2% presence in terms of revenues in this domain. European fabless companies are small and struggle to scale up because of the lack of funding. Barriers to entry are high for SMEs, because of the significant costs of licensing of IP, Electronic Design Automation tools, and especially mask sets (in the order of M€ for advanced nodes).

Objective: Lower the barriers to entry for SMEs in digital design by setting up a set of measures: a government-backed venture capital fund, incentive programmes dedicated to SMEs in design of digital IP blocks, a pooling programme to share resources and licenses among SMEs (a coordination at European level is possible).

Implementation: engage with national financing institutions to set up a government-backed venture capital fund to increase access to finance by SMEs and start-ups for the development of digital designs and IP blocks.

Target population: Fabless companies, SMEs in digital design and IP.

State Aid compliance: The envisaged investment may entail State aid for SMEs and potentially financial intermediaries depending on the specific structure and purpose of the project. A compatible structure could be established in compliance with Article 21 of the General Block Exemption Regulation (GBER), without prior notification to the Commission. Compatibility on this basis is subject to certain restrictions on the eligibility of beneficiaries as well as the set-up of the fund. In particular, a certain amount of additional finance from independent private investors needs to be mobilised. Schemes beyond the limits provided in GBER need to be designed in line with the Risk Finance Guidelines and can be declared compatible following notification.

Timeline: start in 2021.

iii) A.7 - Develop support programmes for companies active in the development of energy-efficient embedded components for devices at the edge of the network, notably edge AI chips, to be integrated in edge-cloud platforms

Challenges: Data is mostly produced by devices at the edge of the network and is growing rapidly. It is expected that by 2025 there will be over 50 billion IoT connected devices, also boosted by 5G connectivity. The demands of processing power keeps growing at a fast pace

[26] Fabless companies design and sell chips but outsource their fabrication to semiconductor foundries.

with the amount of data generated, and so is the amount of energy needed. Further, AI is bound to become pervasive transforming every industry processing data either locally at the edge or remotely in the cloud, but a fundamental issue is that AI is highly demanding in terms of energy. Such energy needs are technically, economically and environmentally unsustainable.

Objective: Considering the surge of connected devices at the point of use, maximum power efficiency in data processing is essential and domain-specific architectures are required. The objective is to produce by 2025 processors dissipating 90% less energy than today, and further implement AI in brain-inspired chips delivering 2 or 3 orders of magnitude higher energy efficiency.

Implementation: Develop a support programme for companies engaging in Research and Development and Innovation (R&D&I) activities for energy-efficient processors and AI accelerators. Under the Digital Europe Programme, Testing and Experimentation Facilities are foreseen to support EU companies active in the development of advanced computing devices for Edge AI applications in fields such as manufacturing, agriculture, healthcare, automotive and transportation. Companies participating in the proposed national support programme can apply for making use of the EU facilities to develop and test product prototypes employing the most advanced low-power computing technologies at favourable conditions and also benefit from the support of Digital Innovation Hubs where needed.[27]

Target population: Fabless companies and SMEs active in digital design and development of IP in processors for AI applications.

State Aid compliance: The envisaged investment may include State aid depending on the specific structure and purposes of the financed projects. In particular, the existing R&D&I State aid rules (both the R&D&I Framework and the relevant GBER articles) already address the State aid support to: i) any R&D activity (for both industrial research and experimental development), related to any digital technology, product or service, including the ones for development of advanced computing devices for Edge AI applications as mentioned above; ii) the setting up and operation of Digital Innovation Hubs (DIHs), which could also be supported under the existing provisions for innovation clusters; iii) SMEs which would use the services provided by said DIHs could benefit from State aid support for innovation advisory services. The envisaged modification of the R&D&I State aid rules will ensure the conditions for State aid support to Technology Infrastructures, under which the aforementioned Testing and Experimentation Facilities would fall.

[27] Such participation is without prejudice of the respect of the principles of additionality and complementarity of funding. In particular, in line with Article 8 of the (proposed) Regulation, support under the Recovery and Resilience Facility shall be additional to the support provided under other Union funds and programmes and should not finance the same cost twice to avoid double funding.

iv) Other examples

- **A.8 - Support investments in state-of-the-art equipment and transfer of knowledge by Europe's world-leading research and technology organisations** in advanced computing technologies. Leading-edge equipment for advanced semiconductor process and fabrication technologies would enable RTOs[28] to bring novel computing technologies to high Technology Readiness Levels (TRL),[29] significantly accelerating industrialization and time-to-market for end-user companies. Such infrastructure can also be used by participants in the Testing and Experimentation Facilities for Edge AI in the Digital Europe Programme to support enterprises wishing to develop and test custom-designed prototypes for field validation. The scope is to advance the level of EU R&D&I in advanced technologies so as to propel European industry into a leadership position in the supply and adoption of next-generation low-power processors based on innovative technologies such as neuromorphic or quantum computing.
- **A.9 -** Design **support frameworks** for investments in qualifying infrastructure for research and development of technologies for the fabrication, or the advanced packaging, of innovative energy-efficient microelectronic components. This initiative would be implemented through a programme offering incentives to projects selected from an open call, involving investments by enterprises in new facilities, machinery and equipment required to develop technologies to manufacture, process or integrate innovative microelectronic components that offer substantial improvements in terms of energy efficiency. To support the development of more energy efficient microelectronic components, R&D&I State aid rules could be invoked; the equipment for such R&D project, to the extent used for and for the duration of the project, could be an eligible cost.
- **A.10 - Support companies engaged in the development of new products** based on open-source hardware, notably open reference architectures for processors and other microelectronics components. The high upfront costs in licensing Intellectual Property represent a critical barrier to entry for small enterprises in hardware design and development. Such costs could be supported by State aid either for industrial research or experimental development projects, where they form part of the eligible costs, or through the provisions on Innovation State aid to SMEs. Open-source hardware, besides providing a low-cost alternative for academia to train electronic engineers, offers a level-playing field for innovative spin-offs and start-ups. Industrial research and experimental development activities enjoy more favourable conditions with aid measures under the GBER in terms of increased by 15% aid intensity when projects results are widely disseminated through free or open source software. This measure would entail the set-up of support frameworks with open calls for enterprises and/or

[28] As defined in footnote 14.
[29] https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

collaborative projects proposing the development of open-source hardware components such as processors.

Cloud, Edge and Data

a. Examples of reforms

i) B1 - Upgrade (where existing) and build the next generation of resilient European, interconnected, real-time, energy efficient, highly secured and distributed cloud to edge data centres and related nodes, for both the private and public sector

Context: The massive increase of data flowing across the EU creates an unprecedented growth opportunity for our economy that must be seized to build the next generation competitive advantage for the EU.

Challenge: A 'paradigm shift' in data processing in the EU is taking place with more than the 80% of the data to be stored by 2025 to be at the edge. The EU must thus get equipped with the next generation of cutting edge, sustainable, real-time and trusted cloud to edge data processing capacities to unlock the full benefits of the EU data opportunity and generate sustainable growth.

Objectives: (1) To build (and upgrade) data centres and edge nodes with the highest requirements in terms of sustainability, security and connectivity across the EU and (2) to interconnect existing cloud and edge data centres scattered across the EU. Both (1) and (2) will ultimately equip Europe with a pan-European cross-border cloud to edge backbone which will make accessible data, cloud and edge services to end-users in real-time from anywhere across the EU territory.

Investments: Software, cooling systems, hardware equipment, national fibre and servers, cloud interconnection – including to highly distributed edge nodes – and network connectivity investment.

Implementation: National procurement by the Member States can be used for the upgrade and building of cutting-edge cloud and edge national data centres (objective 1). European calls for project proposals with up to a 50% co-financing grant rate coming from the Connecting Europe Facility 2 (CEF2) to support both cross-border and national interconnections of data centres located in the national territories of Member States to be launched by the European Commission (objective 2). CEF2 grants can be allocated to consortia composed of both public and private actors. Possible support from InvestEU is likely to be foreseen.[30] The remaining funding for this measure could come from RRF, other public resources, and from direct private contributions from private operators, provided that RRF does not finance the same cost so as to avoid double funding (in line with Article 8 of the (proposal) Regulation),

[30] Pending confirmation by the co-legislators of the relevant provisions in the InvestEU Regulation expected by end 2020.

and that the total funding from RRF and other EU programmes does not exceed the total cost of the eligible action.[31]

Target population: Public entities, businesses including SMEs and cloud, telecom and data centre providers operating across the EU territory.

State aid compliance: The envisaged public support measures may amount to State aid depending on the specific structure and purposes of the project.

For instance, measures to support innovative large cross-border projects to build interconnected, energy efficient, highly secured, real-time and distributed cloud-to-edge data centres and related nodes could be authorised by the Commission:

- To support the development of more energy efficient and secure cloud, the Research and Development and Innovation (R&D&I) State Aid rules (GBER and R&D&I Framework), for both industrial research and experimental development projects can be used.
- As an alternative, productive investment in this field, for instance for data centres, could benefit from aid without notification, in accordance with the State aid rules, anywhere in the EU when performed by SMEs.[32] This could also be the case for large enterprises in assisted areas.[33] Outside the General Block Exemption Regulation, aid may be granted to productive investment under the conditions described in the Regional Aid Guidelines.[34]
- It also appears possible to consider that financing of certain projects under this reform that will bring a significant private participation could rule out the presence of State aid. If at least 30% of investment comes from private operators and the State invests under the same terms (same level of protection, proportional sharing of risks and of revenues) such support could be considered under market terms and therefore would not need to be notified for Commission's approval.

Timeline: 2021-2026 period.

---

[31] Reforms and investments foreseen in Member States' Recovery and Resilience plans may receive support from other Union programmes and instruments provided that such support does not cover the same cost. Member States shall ensure the effective and efficient functioning of such synergies, through a consistent and harmonised approach of all involved authorities. Since the same expenditure cannot be financed twice, national authorities should clearly and strictly differentiate the specific measures, activities and projects funded under the Recovery and Resilience Facility from those financed under other Union programmes and instruments. Member States should clearly indicate expected money from other funding sources when calculating financing needs for investments. In addition, Member States should seek compatibility and possible synergy in their recovery plans (i.e. identification of planned EU financing). It should be avoided that the two sources of financing support competing, financing schemes. Complementarity can be ensured by considering the financial profile and financing needs of the targeted investments. See COM(2020) 408 final.

[32] Article 14 of the General Block Exemption Regulation (GBER) for SMEs in assisted areas; Article 17 of the GBER for SMEs in non-assisted areas.

[33] In accordance with the conditions laid down in Article 14 of the GBER.

[34] Guidelines 2013/C 209/01 on Regional State aid for 2014-2020.

b. Examples of investments

i) B.2 - Stimulate the emergence and deployment of the next generation of federated and competitive European cloud to edge services and platforms, leveraging existing initiatives,[35] which respond to new end users' needs in times of post-recovery

Challenge: Today's cloud services and platforms are often the result of the externalisation of computation and data storage capabilities previously managed in-house to realize ICT efficiency gains. Yet, cloud services and platforms are not designed to fully seize the strategic and innovation potential associated to the deployment of cloud and edge computing technologies that end-users could benefit from. Indeed, low power scalability, elasticity in real time, smart system integration, data mapping, service modularity on demand across the entire computing stack are not yet key attributes offered into existing cloud services and platforms. In particular, the design of edge services which allow real-time data processing closer to where the end-users are physically located and; the building of modular and interoperable business cloud platforms enabling strategic data industrial services are still in their infancy.

Objective: Build the next generation of innovative cloud to edge service and platform capabilities across the EU to maximize the social and economic welfare of its end-users. This might imply research in cloud architecture interoperability, business development for modular industrial cloud platforms; the design of the next generation of cloud-native applications, the set-up of computing and data ecosystems;[36] the development of secured cross-cutting software and cloud enabled business data services.[37]

Implementation: Project calls for industrial research, design, development and deployment launched at the level of a single Member State or jointly with other Member States.

Target population: Existing companies providing cloud, edge services and platforms. Examples include private companies operating in the fields of system integrator, software, telecommunication, cloud, internet of things.

State aid compliance: The envisaged public support measures may amount to State aid depending of the specific structure and purposes of the project if such investments are provided via Member States or, more generally, if they entail public resources.

Timeline: 2021-2026 period.

[35] Such as those in Austria, Belgium, Estonia, France, Greece, Ireland, Italy, Lithuania, Poland, Portugal, Spain , and GAIA-X. The European Open Science Cloud (EOSC) could also be leveraged where directly contributing to build the next generation of federated cloud business capabilities in the EU. Where appropriate the recommendations developed by the Digital Transport and Logistics Forum on federated platforms could also be utilized.

[36] Such as low power consumption and secured common data storage service; an ultra-fast data workload optimization service between central and edge clouds.

[37] Such as identification and security management services data anonymization and masking services and data mapping service.

ii) B.3 - Support public entities, business - including SMEs - and users and providers of Common Data Spaces to uptake high speed, trusted and sustainable cloud capabilities ("cloudification[38]") to boost their transition in post pandemic recovery

Challenge: Traditional sectors of the EU economy were severely hit by the pandemic, which has put pressure on their ability to generate revenues and contribute to EU sustainable growth. Realising efficiency gains to enable savings to be redirected to added value core business functions become essential to continue operating as a business and recover.

Objective: Enable efficiency gains within traditional economic sectors with the use of cloud capabilities for transitioning companies' internal operations in a sustainable and secure manner including the procurement activities, IT and core business functions – given that cloud computing enables to decrease in average total IT spending of a company between 30 up to 50%.

Implementation: Calls for expression of interest launched at national level among the national sectors most severely hit by the pandemic to select a first pool of projects. Selected candidates will receive both technical and financial assistance to support the cloudification of their internal IT systems and processes.

Target population: Traditional sectors of the economy.

State aid compliance: The envisaged public support measures may amount to State aid depending of the specific structure and purposes of the project if such investments are provided via Member States or, more generally, if they entail public resources.

If RRF funding is provided only for cohesion purposes, aid for initial investments into "cloudification" could be compatible with the internal market if it complies with the regional aid rules of the General Block Exemption Regulation (i.e. there would be no need to notify to the Commission for approval). Outside the General Block Exemption Regulation, aid may be granted under the conditions described in the Regional Aid Guidelines (in which case notification and approval by the Commission would be needed).

Timeline: 2021-2026 period.

iii) Other reforms and related investments

- **B.4 - Support the operationalisation of Common Data Spaces via secure data hosting, access and exchange; product and service data innovation orchestration and; the stimulation of computing and data ecosystems**. *Related investments might cover*: the running of living labs, professional services; technical assistance for the development of the technical requirements to host common data spaces and; business development investments to support the building of the next generation of cloud-enabled data services.

[38] Usage of cloud capabilities: infrastructures, platforms and services.

Cross-cutting topics

a. Examples of reforms and investments

- **C.1 - Training** of specialists in electronic component and system design, semiconductor manufacturing, software, AI and security. Training of data specialists, data stewards and development of new digital skills related to cloud computing, primarily for SMEs, start-ups and public entities, with programmes and apprenticeships including reskilling and upskilling of workforce to green digital skills. These actions could be developed in close collaboration between businesses, excellence centres and tertiary education providers to create a virtuous circle to attract young talent, experienced mentors and retain the future skilled workforce.[39]

4. Green and digital dimensions of the component

1) Green transition

The (proposed) Regulation COM(2020) 408 establishing a Recovery and Resilience Facility as amended by Council sets a binding target of at least 37% of the plan's total allocation to contribute to climate mainstreaming.[40]

Digital for green - Investing in technologies, such as ultra-low power processors, will enable large improvements (at least XX%) in energy efficiency and contribute to the reduction of greenhouse gas emissions by XX%. For example, power management chips are crucial enablers for new electric vehicles (and charging stations) and a significant increase in production capacity will be essential for their roll-out in Europe.

Greening data centres - A green transition is enhanced through the digitalisation of some sectors: smart grids, autonomous cars, teleworking/studying/health all require advanced digital tools. While the net effects on the environment are positive, the ICT sector needs to become greener itself. The Commission has set an objective to have climate-neutral, highly energy efficient and sustainable data centres by no later than 2030. Today, data centres account for about 3% of Europe's energy demand. Investing in greener data centres, such as by a smoother integration into the energy system, will therefore yield large positive results in terms of reducing the carbon footprint of Member States. Some low hanging fruit exist as illustrated by the fact that still about 25% of the energy demand by data centres heads towards traditional data centres (i.e. that do not operate cloud services) which is still most of the time cooled away instead of reused to heat homes or for low-temperature heat needs.

Therefore, by comprising X% climate expenditures (see Table 1 below) this component contributes to the 37% climate mainstreaming target set out in Article 15(3)(c) of the

[39] Reference is made to the flagship "Reskill and upskill", SWD (2020) 205.

[40] Communication COM(2020)575 on the Annual Sustainable Growth Strategy 2021 sets out a climate target of 37% for each national Recovery and Resilience Plan, to follow the commitment of the European Council of July 2020. This is reflected in the 7th compromise proposal put forward by the German Presidency on the proposal for a Regulation COM(2020)408 as a Council negotiating mandate.

proposed Regulation COM(2020) 408 as amended by Council [*where relevant, provide more details on how the expenditures of each investment/reform relates to the climate target, including an explanation for the choices made in Table 1*].

In addition, the component proposed measures contribute to the green transition, for instance by considering the six climate and environmental objectives as defined in Regulation (EU) 2020/852 (Taxonomy Regulation). [*Provide more details, justification and evidence on how exactly the measures contribute to the environmental objectives as defined in Regulation (EU) 2020/852 (Taxonomy Regulation)*]. There are clear commitments and mechanisms in each of the reform and investment to ensure that the *do no significant harm* principle is respected and effectively implemented for the other environmental objectives as defined in the EU Taxonomy Regulation. [*Further details, evidence and justification needed to explain how each reform/investment relates to the 'do no significant harm' principle defined in Regulation 2020/852 (Taxonomy Regulation).*]

2) Digital transition

The (proposed) Regulation COM(2020) 408 establishing a Recovery and Resilience Facility as amended by Council sets a binding target of at least 20% of the plan's total allocation to contribute to the digital transition or to the challenges resulting from it.[41]

Data, cloud and edge infrastructures and services and microelectronics are fundaments to Europe's digital transition, as they provide, respectively, the 'fuel' and 'engine' for the digital economy. Investing in such capacities will enable a more affordable, continuous, sustainable, and secure supply of computing power to the economy.

Furthermore, data, cloud and edge capabilities are also enablers to a swift uptake of emerging technologies such as AI, blockchain, big data; and the basis for the development of sectoral digital applications in health, education, manufacturing, tourism and financial services.

Microelectronics components capture, generate, process, transfer and act upon data, and are the basic building blocks for digitalisation in all sectors. Scaling up microprocessor capacities is thus crucial for a resilient European digital transition.

By comprising X% digital expenditures (see Table 1 below) this component contributes significantly to the 20% digital target set out in Article 15(3)(c) of the (proposed) Regulation COM(2020) 408 as amended by Council [*where relevant, provide more details on how the expenditures of each investment/reform relates to the digital target, including an explanation for the choices made in Table 1, in particular if you choose to increase the coefficients for support to the digital objective from the values set out in Annex III of the (proposed) Regulation COM(2020) 408 as amended by Council.]*

[41] Communication COM(2020)575 on the Annual Sustainable Growth Strategy 2021 proposes setting a 20% digital target for each national Recovery and Resilience Plan. This was endorsed by the European Council of 1-2 October. This is reflected in the 7th compromise proposal put forward by the German Presidency on the proposal for a Regulation COM(2020)408, as a Council negotiating mandate. See Article 15(3)(c1), which sets out the 20% digital target, based on a methodology for digital tagging set out in Annex III.

[Please fill in Table 1[42] from the template on the contributions of the measures to the green and digital transitions. Please note that when relevant investments/reforms contribute to the mutually reinforcing goal of the twin transition, Member States can simultaneously associate those to both one green intervention field and one digital intervention field. The table below is only provided for illustrative purposes and does not reflect the ongoing work for the definition of a common methodology to track digital expenditures.]

[42] A selection of examples of reforms and investments have been inserted in Table 1 for illustration purposes. However, in their RRPs, Member States must include all reforms and investments presented in section 3 of the component.

Table 1. Green and digital impact

Please indicate if 0%, 40% or 100% of the reform/investment contributes to the objective. For reforms/investments and the climate objective, Member States should use the methodology for climate tracking applied for cohesion policy funds, in particular as set out in Table 1, Table 4 and Table 6 of Annex I to [Common Provision Regulation COM(2018) 375] and justify their choice, in particular for reforms. For reforms/investments and environmental objectives, they are invited to follow the same methodology. In both cases, please indicate the relevant intervention field for every reform/investment by choosing the most appropriate one. If several ones can be applied, the Member State should motivate why they choose the selected one. For green objectives, Member States are invited to indicate that the do not significant harm (DNSH) principle is respected defined in Regulation 2020/852 (Taxonomy Regulation).

Short title	Green objectives				Digital objectives		Transition challenges	
	Climate	Environmental	Intervention field	DNSH	Tag		Green	Digital
	Tag	Tag						
A.1 - Microelectronics, Reform: Alignment of national procurement policies towards common standards and certification for trusted semiconductor building-blocks and common requirements for procurement of secure components.*	*0%*	*0%*	*n/a*	*Yes*	*100%*			
A.5 - Microelectronics, Investment: Support large-scale innovative industrial project development in the form of an Important Project of Common European Interest (IPCEI). *	*0%*	*0%*	*n/a*	*Yes*	*100%*			
A.6 - Microelectronics, Investment: Establish a venture capital fund and incentive programmes for SMEs and start-ups in the design of digital components and creation of IP. *	*0%*	*0%*	*n/a*	*Yes*	*100%*			
A.7 - Microelectronics, Investment: Develop support programmes for companies active in the development of energy-efficient embedded components such as edge AI chips. *	*100%*	*40%*	*CPR024*	*Yes*	*100%*			
……								
B.1 - Cloud & Data, Reform: Upgrade (where existing) and build the next generation of resilient European, interconnected, real-time, energy efficient, highly secured and distributed cloud to edge data centres and related nodes, for both the private and public sector. *	*0%*	*0%*	*n/a*	*Yes*	*100%*			
B.3 - Cloud & Data, Investment: Support public entities, business - including SMEs - and users and providers of Common Data Spaces to uptake high speed, trusted and sustainable cloud capabilities ("cloudification") to boost their transition in post pandemic recovery. *	*0%*	*0%*	*n/a*	*Yes*	*100%*			
……								

* Member States might select an intervention field relevant to the green transition if reforms and investments include a strong green element (e.g. upgrade of data centers to produce significant energy efficiency gains in line with the European Green Deal (COM(2019) 640 final); support programs for the production of components to contribute to the reduction of greenhouse gas emissions) and provided that the contribution to the green transition is duly justified and explained.

5. Milestones, targets and timeline

Examples of milestones and targets to measure progress in implementation:

Microelectronics

Reforms

- By date X, publish a set of policies and guidelines on procurement accommodating EU standards and certification requirements for trusted electronics in order to promote the uptake of secure components in public sector services and critical infrastructures;
- By date X, publish policies promoting the use of trusted digital microelectronics components and their implementation, including fiscal incentives for SMEs active in the development and deployment of digital processing solutions, such as power-efficient AI components. By date X, establish a network of Y Digital Innovation Hubs to support enterprises in the deployment of trusted digital hardware components, including AI processors, for the edge networks of vertical sectors such as manufacturing, agriculture, transportation and healthcare;
- By date X, introduce a framework of incentives for risk capital from investors in enterprises active in the development of microelectronics components for the twin green and digital transition, including de-risking schemes based on public guarantee fund and fiscal credits;
- By date X, publish a national strategy on microelectronics, including guidance for the EU and national funding of R&D activities, of SMEs, of innovation in energy-efficient processors and open-source hardware. By date X, complete a national census of companies active in microelectronics;
- By date X, approval of new curricula for training in microelectronics developed in cooperation with the industry and with education and vocational training institutes. By date X, Y training and apprenticeship programmes, including upskilling and reskilling, launched in the fields of design of digital components and systems and in microelectronics manufacturing. By date X, Y people have completed the training programmes.

Investments

- By date X, launch open calls for expression of interest in a new IPCEI in microelectronics, with a focus on data processing, AI and connectivity, among industrial stakeholders, including SMEs and end-user industries. By date X select a pool of projects meeting objectives and requirements for potential participation in the integrated project across Member States. By date X finalise the list of direct participants to the notified projects and of external partners, for a total funding of EUR Y;
- By date X, launch an incentive programme with a government-backed venture capital fund, set up with national financing institutions, to increase access to finance by SMEs and start-ups for the design of digital ICs and development of IP blocks. By date X, at least Y SMEs and start-ups have received support through the venture fund;
- By date X, introduce a new support programme, for a total funding of EUR Y, for companies active in the development of energy-efficient embedded components, particularly AI chips, for IoT devices to be integrated in edge-cloud platforms. By date X, at least Y companies have benefited from the support programme;

- By date X, introduce a support programme for companies engaged in the development of open source hardware, either as IP blocks or full products such as processors and AI chips;
- By date X, release allocated funding for a total of EUR Y to research and technology organisations for the procurement of state-of-the-art equipment for the development of prototypes of processor chips based on next-generation computing technologies, such as neuromorphic or quantum computing;
- By date X, launch incentive programmes including concessions (e.g. fiscal credits) for investments in qualified manufacturing or advanced packaging facilities and equipment delivering substantial increases in energy efficiency, or based in market failure areas.

Cloud, Edge and Data

Reforms

- By date X, all participants that will interconnect their respective data centres are selected;
- By date X, publication of the first tender to build a new data centre l with the highest environmental and security standards;
- By date X, first YY edge nodes are deployed across the territory;
- By date X, all cloud and edge data centres are interconnected;
- By date X, YY data centres are upgraded with the highest requirements in terms of sustainability, security and connectivity;
- By date X, YY new data centres with more than Z racks to be located where waste heat can be used to meet for example space heating or other low-temperature energy needs in nearby buildings or district heating systems where appropriate;
- By date X, all data centres with more than 25 racks, public or private, and operating at capacity PUE (Power Unit Effectiveness) > 1.6 should be refurbished or phased out (and the associate service externalized) and/or with an ERF (Energy Reuse Factor) of at least 50%;
- By date X, refurbished data centres should operate at a PUE <1.6 in warm climate areas, and <1.5 in cold climate areas;
- By date X, newly built data centres (once they operate at capacity) should operate at a PUE <1.4 in warm climate areas, and <1.3 in cold climate areas;
- By date X, all data centres should adhere to and participate, in the Data Centre Code of Conduct.[43]

Investments

- By date X, all selected participants have undertaken the "cloudification" of their internal IT processes;
- By date X, YY traditional companies are assisted to undertake the cloudification of their IT processes in practice;
- By date X, YY manufacturing companies have moved to the cloud in a sustainable and secure manner.

[43] https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct maintained by the Joint Research Centre.

[Only one example of reform with only one milestone and one target is shown here for illustrative purposes, directly in the text. Actual RRPs should include this information in the Excel files attached to the template.]

Table 2. Milestones and targets											
Related reform or investment	**Milestone or target name & number**	**Qualitative indicators (for milestones)**	**Quantitative indicators (for target)**			**Timeline for completion (indicate the quarter and the year)**	**Data source /Methodology**	**Responsibility for reporting and implementation**	**Description and clear definition of each milestone and target**	**Assumptions/ risks**	**Verification mechanism**
			Unit of measure	Baseline	Goal						
Component 1 Example: Cloud, Edge and Data											
Reform 1 : Build (and upgrade) the next generation of European interconnected, energy efficient, highly secured and distributed cloud to edge data centres and related nodes	Milestone 1: First request for tender to build a new data centre with the highest sustainability and security requirements is published	Detail the tender specifications in terms of (a) sustainability and (b) security requirements	*na*	*na*	*na*	Q2 2022	Ministry of Economic Affairs in conjunction with Ministry of Industry, (*add relevant data source and methodology)*	Ministry of Economic Affairs as responsible for reporting; Ministry of Industry as responsible to implement	The Ministry of Economic Affairs is responsible to publish a request for tender for works aiming at building a new sustainable and secure data centre to store the data hold by national ministries. The Ministry of Industry will closely collaborate with the Ministry of Economic Affairs by drafting the detailed tender specifications related to a) sustainability and b) security requirements for the construction of the new data center.	Assumption: Member States are used to procure large scale data processing infrastructures Risk: Limited number of offers will be received	Legal review of the tender specifications; official publication of the tender in national journal
	Target 1: by date X, YY edge nodes are deployed across the territory	*na*	Number of edge nodes available	0	20	Q4 2025	Ministry of Economic Affairs in conjunction with Ministry for Telecommunications (*add relevant data source and methodology)*	Ministry of Economic Affairs as responsible for reporting; Ministry for Telecommunications as responsible to implement	The Ministry of Economic Affairs in close collaboration with the Ministry of Telecommunications will report on a yearly basis on the number of newly created edge nodes (data processing capacities) physically located close to end-users across the territory.	Assumption: Member States are mapping the physical location of data centres across their respective territories as well as the level of cloud uptake among their territory Risk: the level of connectivity in some rural areas across the national territory might not be equipped with high speed networks yet	Yearly national registration of all newly created edge nodes including their physical locations across the territory; yearly monitoring of edge service uptake among businesses, public entities and citizens by the national statistical office

6. Financing and Costs

[Member States should provide information on the total estimated cost of the component, backed up by appropriate justification. This should be complemented by the appropriate detailed justification on the plausibility and reasonability of the estimated costs, as explained in the guidance. The justification can be annexed to the RRP. While the table is introduced directly in the text, actual RRPs should include this information in the Excel files attached to the template.]

Table 3. Estimated cost of the plan

Component (name)	**Investment/Reform (short description or cross-reference)**	**Relevant time period**	**Total estimated costs for which funding from the RRF is requested (mn/bn national currency, e.g. mn EUR)**	**If available: Total estimated cost by year (mn/bn national currency/EUR)**							**Funding from other sources (as requested by Art. 8 in the Regulation)**				**COFOG level 2 category / or type of revenue (if relevant, e.g. tax expenditure)**
											from other EU programmes		*from the national budget*	*Other sources (please specify)*	
				2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*mn.bn nat. currency*	*specify the EU programmes and breakdown by programme if relevant (e.g. regional operational programme)*			